Water Sampling:
What We Test For and Why

June 2004

Washington State Department of Health

Division of Environmental Health
Office of Drinking Water

DOH PUB. #331-262

The Washington State Department of Health, Office of Drinking Water would like to thank Penn State University and Bryan R. Swistock, extension associate, School of Forest Resources, Penn State University, Dr. William E. Sharpe, professor, School of Forest Resources, Penn State University, and James A. Clark, extension agent, McKean County, Penn State Cooperative Extension, for granting permission to reprint portions of their publication entitled, "Water Tests: What Do the Numbers Mean?"

Water Sampling: *What We Test For and Why*

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About This Publication

Congratulations! If you are interested in this publication, you must have had your water tested. That's a big step toward ensuring that your water supply is safe to drink. But are you able to understand and interpret what your water test report really means? Water test reports sometimes seem as though they are written in another language. That's where this publication fits in – it will help you translate your water test report into more understandable terms.

The appendices within this document cover the regulated contaminants in Washington State, including health effects (Appendix I) and a glossary of common terms and abbreviations (Appendix II). References to more detailed written and web-based publications can be found on many of the topics and near the end of the publication. You can even get some tips on what to do if your water test report indicates a water quality problem.

A water test report may look confusing, but with a little help you can make sense out of it in no time! If you're ready, let's start learning about your report and what it tells you about the safety of your drinking water.

Why Test Your Water?

The provisions of the federal Safe Drinking Water Act require public water supplies to collect microbiological and chemical samples at various frequencies. This sample collection frequency is determined by each source's water quality history, compliance with previous monitoring requirements and waiver status. Testing the water provides information to both the utility and its customers on the quality of the water to be consumed and whether or not there is a water quality problem that needs to be treated. The results of all the testing is shared with the utilities' customers annually through the Consumer Confidence Report.

Use a Certified Laboratory

Laboratories in the state of Washington are accredited (certified) through the Department of Ecology. A laboratory applies for accreditation for a specific analytical method to use in testing drinking water samples. Not all accredited labs can perform all analyses that might be of interest to you. The "List of Accredited Labs" located on Ecology's web site identifies which categories of testing the accredited lab can do.

Ecology's website also has a database that includes each specific analyte the labs can test: http://www.ecy.wa.gov/programs/eap/labs/labs_main.html

Once you receive your water test report from the accredited laboratory, you're ready to interpret exactly what it means. The example water test report below will get you started by familiarizing you with the information presented in the report.

A Typical Water Test Report

Water Analysis Report

Name of System: XYZ Water System

PO Box 110

Anytown, WA 90000

Laboratory Number: 1000034

Sample Location: sampling station #1

Source Number: S01

Sample Collected By: T. Brewer

Date/Time Sampled: 3/22/04 10:00 AM

Date/Time Sample Received: 3/22/04 1:00 PM

Sample Received By: Ted Beaker, Anylab Laboratories Inc.

Analyte	Result	Unit	Maximum Contaminant (MCL)
Total Coliform Bacteria	P	per 100 ml	0 per 100 ml
Fecal Coliform Bacteria	A	per 100 ml	0 per 100 ml
Arsenic	<0.002	mg/L	0.05 mg/L
Barium	<0.1	mg/L	2 mg/L
Cadmium	<0.002	mg/L	0.005 mg/L
Chromium	<0.01	mg/L	0.1 mg/L
Mercury	<0.005	mg/L	0.002 mg/L
Selenium	<0.005	mg/L	0.05 mg/L
Beryllium	<0.002	mg/L	0.004 mg/L
Nickel	<0.04	mg/L	0.1 mg/L

Analyte	Result	Unit	Maximum Contaminant (MCL)
Antimony	<0.002	mg/L	0.006 mg/L
Thallium	<0.001	mg/L	0.002 mg/L
Cyanide	<0.05	mg/L	0.2 mg/L
Fluoride	< 0.2	mg/L	4 mg/L
Nitrite	0.2	mg/L	1 mg/L
Nitrate	16.5	mg/L	10 mg/L
Total Nitrate/Nitrite	16.7	mg/L	10 mg/L
Iron	0.4	mg/L	0.3 mg/L
Manganese	<0.01	mg/L	0.05 mg/L
Silver	<0.01	mg/L	0.1 mg/L
Chloride	16	mg/L	250 mg/L
Sulfate	3	mg/L	250 mg/L
Zinc	<0.05	mg/L	5 mg/L

Comments:

The sample does not meet safe drinking water standards for total coliform bacteria and nitrate.

Submitted by:

Laboratory Director
Anylab Laboratories Inc.

The Components of a Typical Water Test Report

Washington has dozens of water testing laboratories, each with its own way of presenting results. Your water test may not look exactly like the one shown here, but it probably contains the same basic components. Read about each water test component below and try to find it on your own water test report.

Remember that these are only the most common components of a typical water test report. Some laboratories will include additional information such as the method used for each test, an U.S. Environmental Protection Agency (USEPA) number, the initials of the person that completed each test, and the date each test was completed. This information is generally unimportant to the water system.

1. Name of System and Sample Information

Basic information at the top of most water test reports identifies the person who submitted the water sample, where the sample came from, who received it at the laboratory, etc. This is called the chain-of-custody information and could be very important if the results were to be used in any type of legal action.

2. Parameters

All water test reports list the water quality parameters that were tested. The list includes only those you asked the laboratory to analyze or the lab recommended for your water sample. The number of parameters can vary from just a few to dozens of tests. Consult other sections of this publication for a description of each of these tests.

3. Results

The most important information on your water test report are the actual results that the laboratory found for your water sample. The numbers indicate the concentration of each water quality parameter in your water sample. The result for each test should be compared to the drinking water standard, maximum contaminant level (MCL) for that parameter. Sometimes, the lab reports a water test result as “ND” (Not Detected), which means the lab was unable to detect any of that contaminant with its equipment. Similarly, some results may have a less-than sign (<) in front of a number. This result means the sample contained less than the detection level for that test. Detection levels are often set at the permissible drinking water concentration for a particular contaminant. If the less-than symbol (<) appears before a number and the number is equal to the drinking water standard, the water is likely safe to drink for that particular contaminant.

4. Units

Concentrations of contaminants are usually measured in water by a unit of weight such as milligrams per liter (mg/L), or by a number, for example, number of bacteria per 100 milliliters of water (#/100 ml). You might see several different measurement units on your water test report. Refer to the section “Understanding Units” on page 5 to learn more about these. In some cases, the unit of measure for each test will be shown next to the result. In others, the units will be shown in a separate column (as in the example test report).

5. Standards

Many laboratories include the specific drinking water standards (MCL) on the report next to each test result. This allows for an easy comparison of your result with the safe or recommended maximum level for each test parameter. A complete list of up-to-date drinking water standards (published by the USEPA) can be found in Appendix I in this publication.

6. Comments

Some water testing laboratories will include a brief explanation of your water test results. They often list those contaminants that did not meet the drinking water standard. Occasionally, these comments also describe the potential harmful effects of contaminants that exceed the standard and how to remove these contaminants from the water. Some laboratories, however, do not provide comments, so you need to review the results yourself. Do not rely on the laboratory to point out important information.

What Are Drinking Water Standards?

Drinking water standards give the level of a contaminant that is acceptable in water. These standards are set by the USEPA, using available research data. The USEPA sets standards for contaminants that are known to occur in water, are detectable in water, and cause a health or aesthetic problem in water. USEPA sets these standards, but it is up to the Washington Department of Health, Office of Drinking Water to enforce the standards when and where they apply.

Two types of drinking water standards are used: primary and secondary. Primary standards are set for contaminants that cause some health effect such as illness, disease, cancer, or another health problem. Adherence to these standards is mandatory for public water systems. Primary standards are also known as Maximum Contaminant Levels or MCLs.

Secondary standards are created for water contaminants that cause aesthetic problems such as bad taste, discoloration, or odor. Secondary standards are also known as Secondary Maximum Contaminant Levels (SMCLs).

Understanding Units of Measurement

All drinking water test results and standards have a unit associated with them. These units give the amount of the contaminant per unit of water. The most common unit is the milligram per liter (mg/L), which expresses the milligrams of a contaminant in every liter of water. Some laboratories prefer to use parts per million (ppm), which is identical to milligrams per liter. Some contaminants that can be measured in very small quantities are reported in micrograms per liter (µg/L), which is identical to a part per billion (ppb). Keep in mind that concentrations expressed in mg/L (or ppm) can be converted to µg/L (or ppb) by multiplying by 1,000, and that µg/L (or ppb) can be converted to mg/L (or ppm) by dividing by 1,000.

The Most Common Water Test Units

- milligrams per liter (mg/L) = parts per million (ppm)
- micrograms per liter (µg/L) = parts per billion

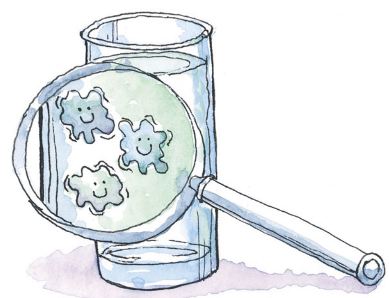
Most contaminants occur in water in very small concentrations. The units shown above are designed to express these small concentrations. The following examples illustrate just how small these units really are.

- One milligram per liter (mg/L) or part per million (ppm) corresponds to one minute in two years or a single penny in $10,000.
- One microgram per liter (µg/L) or part per billion (ppb) corresponds to one minute in 2,000 years or a single penny in $10,000,000.

Although most water quality measurements are expressed in these units, some tests such as bacteria, corrosivity, turbidity, and radon use different units. To learn more about these other units, refer to the discussions on individual parameters in the following section.

Descriptions of Common Contaminants (by category)

Hundreds of contaminants can occur in drinking water. They can be grouped into four basic categories: microbial, inorganic, organic, and radiological. Although over 100 contaminants have drinking water standards (see Appendix I for a complete list), many of these contaminants are very rare in Washington. The following sections briefly discuss 40 of the most common contaminants in drinking water in Washington State. These contaminants are listed alphabetically within the four categories.



Microbial Contaminants

Microbial contaminants include bacteria, viruses, and protozoans. These are living organisms that are visible in water only with the help of a high-powered microscope. Many different kinds of bacteria, some disease causing, may be present in a water supply. The tests discussed below are specific bacteria tests used to determine whether disease-causing bacteria may be present in the water. Protozoans are less common in water than bacteria, but a few can be problems. Viruses will not be discussed because they are expensive and difficult to test, however, viruses such as hepatitis are carried by water and can cause serious illness.

Coliform Bacteria

Coliform bacteria are a large group of bacteria that occur throughout the environment. They are used as an indicator organism to indicate the potential for disease-causing bacteria to be present in water. In other words, if coliform bacteria are present, it is presumed that a contamination pathway exists between the bacteria source and the water supply and disease-causing bacteria may use this pathway to enter the water supply.

Most coliform bacteria do not cause disease, but the greater their number the greater the likelihood that disease-causing bacteria may be present. Since coliform bacteria stay in water longer than most disease-causing organisms, the absence of coliform bacteria leads to the assumption that the water supply is microbiologically safe to drink. Consuming water with coliform bacteria present may cause gastrointestinal illnesses, fever, and other flu-like symptoms. Therefore, the drinking water standard requires that no coliform bacteria be present in public drinking water supplies.

Results from coliform bacteria tests are normally expressed as “Present” (P), or “Absent” (A). In this case, “Present,” indicates only that at least one bacterium was present in each 100 ml of water. Occasionally, bacteria results will be expressed as “MPN,” which stands for Most Probable Number. This simply means that the lab estimates the number of bacteria in your sample. Finally, bacteria results also may be reported as “TNTC,” or “Too Numerous To Count,” meaning the bacteria concentration was too high to quantify.

Fecal Coliform Bacteria

Fecal coliform bacteria are a smaller group of bacteria within the coliform bacteria group. Fecal coliform bacteria are specific to the intestinal tracts of warm-blooded animals. If the total coliform test is positive, the lab tests the water sample for fecal coliform bacteria. Fecal coliform bacteria levels are expressed as the number of colonies per 100 ml of water. No fecal coliform bacteria are permitted in public drinking water supplies.

E. Coli

An even more specific bacteria test is the test for *E. coli* (short for *Escherichia coli)*. This is a type of fecal coliform bacteria commonly found in the intestines of animals and humans. A positive *E. coli* result is a strong indication that human sewage or animal waste has contaminated the water.

Hundreds of strains of *E. coli* exist. Although most are harmless and live in the intestines of healthy humans and animals, a few can produce a powerful toxin that causes severe illness and even death. Infection often causes severe bloody diarrhea and abdominal cramps; sometimes the infection causes non-bloody diarrhea. Frequently, no fever is present. It should be noted that these symptoms are common to a variety of diseases and may be caused by sources other than contaminated drinking water.

E. coli tests are reported as the number of bacteria per 100 ml of water. The presence of any *E. coli* in a water sample is unacceptable; thus, the primary drinking water standard for *E. coli* is 0 per 100 ml of water.

Standard Plate Count (Heterotrophic Plate Count)

The Standard Plate Count (SPC) or Heterotrophic Plate Count (HPC) is a more general indicator of bacterial contamination. On some test reports, this also may be referred to as the "Total Bacteria Count." It measures all the bacteria, including coliform and many other groups, in a water sample. The SPC is usually reported as the number of bacteria per milliliter of sample. There are no drinking water standards for SPC, but if more than 500 bacteria are counted in one milliliter of sample, further testing for total coliform or fecal coliform bacteria is suggested.

Iron Bacteria

Iron bacteria are a type of bacteria that feed on small amounts of iron in water. Iron bacteria are not a health threat, but are a nuisance because they form strands, masses, or thin films that plug pipes, toilets, and plumbing fixtures and reduce flow from wells. Their appearance can vary from orange or brown to clear. Iron bacteria can colonize an entire water system from the well itself through the plumbing, or they may be present only in parts of the plumbing system.

There are no drinking water standards for iron bacteria. Rather, their presence is normally enough of an aesthetic problem to require treatment. Water testing is rarely available to determine if iron bacteria are present. Confirmation is usually based upon the visual symptoms in the water.

Giardia and Cryptosporidium

Giardia lamblia and *Cryptosporidium parvum* are small microscopic animals known as protozoa. They both can live in the intestinal tract of mammals, including humans. While there, they multiply by producing oocysts. Infected animals and humans can excrete the oocysts, which can then contaminate water sources. Both giardiasis and cryptosporidiosis cause severe diarrhea, nausea, fever, headache, vomiting, and loss of appetite.

Both illnesses can be life-threatening to people with depressed immune systems. Most outbreaks have occurred in communities that use surface water supplies (streams, rivers, lakes) where the oocysts can commonly be found. Shallow springs or poorly constructed wells that become contaminated with surface water could also contain *Giardia* and *Cryptosporidium* oocysts.

Both *Giardia* and *Cryptosporidium* are measured in water by passing large volumes of the water through a small filter and examining the filter under a microscope for oocysts. Oocysts should be totally absent for water to be safe to drink.

Inorganic Chemicals (IOCs)

The second category of water contaminants includes inorganic chemicals. These are usually substances of mineral origin. Salt, metals, and minerals are examples of inorganic chemicals. The chemicals discussed alphabetically below are the most common inorganic contaminants in Washington water supplies, or they are of the greatest health concern.

<u>Arsenic (As)</u>

Arsenic occurs in groundwater from both natural sources and human activities, like runoff from orchards or glass and electronics production wastes. In drinking water, it is odorless and tasteless. Elevated levels of naturally occurring arsenic are present in some central and northern Puget Sound counties. These levels of arsenic in groundwater are thought to be attributed to geologic formations rather than human activities. Arsenic has a primary drinking water standard because it can cause skin lesions, circulatory problems, and nervous system disorders. Prolonged exposure also can cause various forms of cancer. The present arsenic drinking water standard is 10 µg/L (0.010 mg/L).

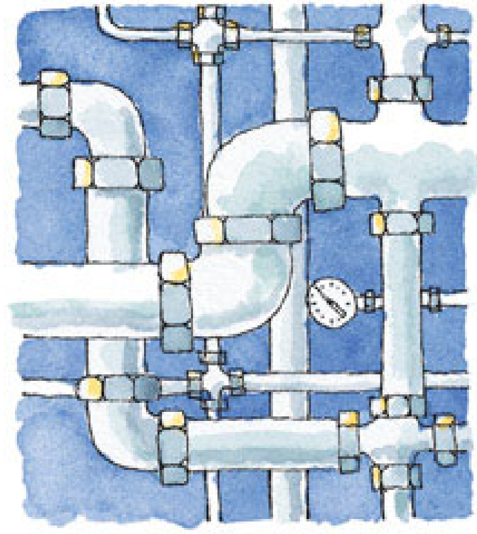
<u>Chloride (Cl)</u>

Typically the concentration of chloride ions in water is used to identify saltwater intrusion. Saltwater intrusion is a problem in the Puget Sound area, specifically in the islands of Island and San Juan Counties. Chloride has a secondary drinking water standard of 250 mg/L because it may cause a salty taste in the water.

<u>Copper (Cu)</u>

Copper usually originates from corrosion of copper plumbing in the home (see “Corrosivity,” below). Copper causes a bitter, metallic taste in water and a blue-green stain in sinks and bathtubs. Copper levels above 1.3 mg/L are a health concern because they may cause severe stomach cramps and intestinal illnesses. Copper can be reduced in water using the corrosion control strategies outlined below.

Corrosivity



Corrosive water is a term used to describe aggressive water that can dissolve materials with which it comes in contact. It is a problem because many homes have copper or galvanized pipes, lead solder joints, and brass plumbing fixtures. Thus, corrosive water may cause increases in copper and lead concentrations in drinking water.

Symptoms of corrosive water problems include metallic taste, bluish-green stains in sinks and bathtubs, and, in severe cases, small leaks in the plumbing system. Because corrosive water is not a health concern by itself, there is only a secondary standard that water be noncorrosive.

Iron (Fe)

Iron is a common natural problem in groundwater in Washington and has a secondary drinking water standard of 0.3 mg/L. Iron does not cause health concerns but causes aesthetic problems such as metallic tastes and orange-brown stains.

Lead (Pb)

If lead is detected in your drinking water, it probably originated from corrosion of your plumbing system. Lead was a common component of solders used in plumbing systems until it was banned in 1991. If your home was built before 1991 and has a metal plumbing system, it is likely some lead is present. If your water supply is corrosive (see discussion above), any lead present in the plumbing system may be dissolved into your drinking water. Lead concentrations are usually highest in the first water out of the tap (known as “first-draw” water), since this water has been in contact with the plumbing for a longer time. Lead concentrations typically decrease as water is flushed through the plumbing system.

Lead poses a serious health threat to the safety of drinking water. It is colorless, odorless, and tasteless. Long-term exposure to lead concentrations in excess of the drinking water standard has been linked to many health effects in adults including cancer, stroke, and high blood pressure. At even greater risk are the fetus and infants up to four years of age, whose rapidly growing bodies absorb lead more quickly and efficiently. Lead can cause premature birth, reduced birth weight, seizures, behavioral disorders, brain damage, and lowered IQ in children. The U.S. Environmental Protection Agency considers lead to be the most serious environmental health hazard for children in the United States.

In rare cases, the source of lead in drinking water might be from groundwater pollution rather than corrosion of the plumbing system. Such pollution may be the result of industrial or landfill contamination of groundwater. The source of the lead usually can be determined by comparing water test results from a first-draw sample versus a sample collected after the water runs for several minutes. If the lead concentration is high in both samples, the source of the lead is likely from groundwater contamination.

Manganese (Mn)

Like iron, manganese is a naturally occurring metal. It has a secondary drinking water standard of 0.05 mg/L. Manganese does not cause health concerns but causes aesthetic problems such as objectionable tastes or blackish water stains.

Nitrate (NO3) or Nitrate Nitrogen (NO3-N)

Nitrate in drinking water usually originates from fertilizers or from animal or human wastes. Nitrate concentrations in water tend to be highest in areas of intensive agriculture or where there are many septic systems.

Nitrate has a primary drinking water standard that was established to protect the most sensitive individuals in the population (infants under 12 months of age, pregnant women, and people with certain blood disorders). These segments of the population are prone to methemoglobinemia (blue baby disease) when consuming water with high nitrate.

Nitrate may be reported on your water test report as either nitrate (NO3) or nitrate-nitrogen (NO3-N). Look carefully at your report to determine which form of nitrate is being reported. The primary drinking water standard or MCL is 10 mg/L as nitrate-nitrogen (NO3-N).

Turbidity

Drinking water should be sparkling clear for health and aesthetic reasons. Turbidity refers to fine particles of clay, silt, sand, organic matter, or other material that might reduce the clarity of water. Turbidity makes water unappealing to drink because of its muddy appearance. Particles may also shield disease-causing bacteria from chlorine or other treatment and provide nutrients for bacteria and viruses to flourish.

Turbidity usually indicates direct pollution from surface runoff often during or shortly after heavy rainfall. Turbidity is usually measured in a special unit known as an NTU or Nephelometric Turbidity Unit. The standard for turbidity depends on the type of water treatment technology used. Water treatment plants using conventional or direct filtration are required to have less than or equal to 0.3 NTU in at least 95% of measurements taken each month. Slow sand and diatomaceous earth filtration plants are required not to exceed 1 NTU in at least 95% of measurements. Water with more than 1 NTU of turbidity makes disinfection to kill bacteria difficult.

Organic Chemicals

Organic chemicals are a group of over 100 mostly man-made chemicals. They can occur in drinking water sources from industrial activity, landfills, gas stations, or pesticide use. Many organic chemicals are carcinogenic (cancer causing), so they often have very low drinking water standards, usually measured in µg/L.

Generally, organic chemicals are grouped into two major categories: volatile organic chemicals (VOCs) and synthetic organic chemicals (SOCs). The discussion below introduces these two groups and describes in detail the most common examples in each group. Appendix 1 lists the drinking water standards for all organic chemicals.

Volatile Organic Chemicals (VOCs)

VOCs are man-made compounds that are released from water into the air. They present a health risk not only from drinking contaminated water, but also from inhaling VOCs that escape from the water as it is used during showering or other home uses. VOCs also are absorbed directly through the skin during bathing and showering. They are commonly used as solvents, fuels, paints, or degreasers. Virtually all VOCs produce an odor in water, although it may not be obvious before the drinking water standard is exceeded. Nearly all VOCs have primary drinking water standards, because they cause cancer or damage to the liver, kidneys, nervous system, or circulatory system. Dozens of VOCs are regulated in public water supplies, but the most common are described below.

Benzene

Benzene is a clear, colorless liquid used primarily as an industrial solvent. It is lighter than water, migrates easily in groundwater, and is slow to decay. It is also present as a gasoline additive. Because it is a known human carcinogen (causes cancer), benzene has a primary drinking water standard of 0.005 mg/L (5 µg/L).

Carbon Tetrachloride

Carbon tetrachloride is a colorless liquid that is heavier than water but migrates easily in groundwater. It has been used mostly in the dry-cleaning industry. Carbon tetrachloride has a primary drinking water standard of 0.005 mg/L (5 µg/L) because it is a probable human carcinogen with other acute effects on the gastrointestinal and nervous systems.

Tetrachloroethylene (PCE) and Trichloroethylene (TCE)

Tetrachloroethylene (commonly known as PCE) and Trichloroethylene (commonly known as TCE) are similar chemicals that have been found around industrial sites and landfills. Most of the groundwater contamination from these chemicals occurred due to improper disposal of industrial wastes. Both chemicals are used as industrial solvents.

PCE is used primarily in the dry-cleaning industry. Both are heavier than water and move freely through soil and groundwater. PCE is a possible carcinogen that causes liver, kidney, and nervous system damage. TCE is a probable carcinogen that also causes acute effects to the liver, kidneys, and central nervous system. Both PCE and TCE have primary drinking water standards of 0.005 mg/L (5 µg/L).

Xylenes

Xylenes are a component of gasoline. They also are used in the manufacturing of some chemicals, and therefore appear commonly in industrial wastes. Xylenes cause liver, kidney, and nervous system damage. Xylenes biodegrade and move slowly in groundwater. The drinking water standard for xylenes is 10 mg/L (10,000 µg/L).

Nonvolatile or Synthetic Organic Chemicals (SOCs)

Nonvolatile organic chemicals are also known as Synthetic Organic Chemicals or SOCs. Nearly all SOCs are pesticides, with a few notable exceptions (PCBs and dioxin). They differ from VOCs because they do not escape readily into the air from water.

The U.S. Geological Survey, in cooperation with the Department of Health, began a statewide sampling program in 1994 to assess the vulnerability of Washington State public water systems to pesticides. 1,326 Group A public water supply wells were selected for sampling. The results from this sampling showed:

- pesticides detected in 6% of 1,103 randomly selected public supply wells sampled across Washington;
- 21 of 27 analyzed pesticides were detected;
- pesticides that were detected in three or more wells included atrazine; simazine; dicamba; 2,4,5-TP; 2,4-D; picloram; and metribuzin; and
- more than 10% of wells with detections had more than one pesticide detected.

Detailed descriptions are given below for some of the pesticides most often found in Washington water supplies.

Atrazine

Atrazine is water-soluble and moves easily into groundwater and surface water after application. Because it is classified as a possible human carcinogen that also damages the liver, kidney, and heart, Atrazine has a primary drinking water standard of 0.003 mg/L (3 µg/L).

Simazine

Simazine is commonly used for control of broad-leaved and grassy weeds on crops, orchards, and Christmas tree farms. It is also used to control plants and algae in ponds and lakes. Simazine has a primary drinking water standard of 0.004 mg/L (4 µg/L) because it is a probable carcinogen that also can cause damage to the testes, kidneys, liver, and thyroid after long exposure. Simazine travels easily through soils to groundwater and persists in groundwater for long periods of time.

<u>2,4-D</u>

2,4-D is commonly used to control broad-leaf weeds in agriculture and woody plants along roadsides, railways, and utility rights-of-way. It has been most widely used on wheat and corn, and on pasture and rangelands. 2,4-D has a primary drinking water standard of 0.07 mg/L (70 µg/L) because it can cause damage to kidneys, liver, or adrenal glands. 2,4-D is readily degraded by microbes located in soil and water. Leaching to groundwater may occur in coarse-grained sandy soils with low organic content.

<u>2,4, 5-TP (Silvex)</u>

2,4,5-TP, banned since 1985, was used as an herbicide to control woody plants, and broadleaf weeds in rice, bluegrass turf, in rangeland improvement programs, and on lawns. Aquatic uses included control of weeds in ditches, riverbanks, on floodways, along canals, reservoirs, and streams. The primary drinking water standard is 0.05 mg/L (50 µg/L) because it has the potential to cause liver and kidney damage.

<u>Picloram</u>

Picloram is commonly used to control weeds such as bitterweed, knapweek, leafy spurge, locoweed, larkspur, mesquite, prickly pear, and snakeweed. Picloram has a primary drinking water standard of 0.5 mg/L (500 µg/L) because it can cause liver damage. Picloram does not adhere to soil and so it can leach to groundwater.

Radionuclides

Radioactivity usually occurs in water from radium, uranium, or radon. These materials emit radioactivity as alpha, beta, or gamma radiation. Each form of radiation affects the human body differently, yet all can lead to cancer. Radioactivity in water is normally measured in picocuries per liter (pCi/L). Appendix I lists several drinking water standards for radioactivity.

What's Your Next Step?

If your water test indicates a problem with your water, you're probably wondering what you should do about it. You have a number of options.

Additional Testing

Further water testing is always a good idea and is often required. Further testing helps confirm, or deny the original results. If you have questions regarding the results you receive, contact the Department of Health Office of Drinking Water regional office to speak with water quality staff for more information on water test results and their meaning.

Maintenance

Some simple maintenance on your water supply may take care of some problems. For example, make sure damaged wellhead seals are water tight; seal any openings around electrical wires exiting the well cap; screening all well and reservoir vents; to prevent surface water contamination of your well and thereby reduce coliform bacteria contamination.

Contamination Prevention

Remove potential sources of contamination (for example, chemicals, fecal material, etc.) within the sanitary control area around your source (a minimum of 100 feet for wells and 200 feet for surface water sources).

New Source

In some cases, it may be easier and less expensive to develop a new source of water rather than treat a source of contaminated water. This might include drilling a new well at a different location away from a source of contamination. This will include working with the departments of Health and Ecology for approval.

Water Treatment

Water treatment processes are available that remove many contaminants from water to make it drinkable. The other options listed above should be considered and compared to the cost of treatment equipment and maintenance.

For More Information

Do you still have questions? There are numerous sources of both written and online information related to drinking water and interpreting water test results. In addition to the specific references listed throughout this publication, the following general locations may be helpful for finding more information on interpreting water test information.

- Your Local Washington State Cooperative Extension Office

  Washington State Cooperative Extension has many agents and university specialists trained in water resources who can help solve your water supply problems. Numerous publications also are available on many water issues.

Water publications online:

http://pubs.cas.psu.edu

http://www.sfr.cas.psu.edu/water

- U.S. Environmental Protection Agency

  Safe Drinking Water Hotline: 1-800-426-4791

  Office of Groundwater and Drinking Water: http://www.epa.gov/ogwdw

  U.S. EPA Drinking Water and Health:
  http://www.epa.gov/safewater/dwhealth.html

- U.S. Department of Agriculture – National Extension Water Quality Program

  http://www.usawaterquality.org/themes/health/default.html

- Washington State Department of Health, Office of Drinking Water

  If you have questions, please feel free to call your Office of Drinking Water Regional Office. They are open Monday through Friday, 8:00 a.m. to 5:00 p.m. If you have an after-hours emergency, call 1-877-481-4901.

  Eastern Regional Office, 509-456-3115
  Serving Adams, Asotin, Benton, Chelan, Columbia, Douglas, Ferry, Franklin, Garfield, Grant, Kittitas, Klickitat, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman, and Yakima counties.
  Northwest Regional Office, 253-395-6750
  Island, King, Pierce, San Juan, Skagit, Snohomish, and Whatcom counties.
  Southwest Regional Office, 509-664-0768
  Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Kitsap, Lewis, Mason, Pacific, Skamania, Thurston, and Wahkiakum counties.

  Related publications from the Office of Drinking Water:
    - Water sampling brochures for the following types of tests: nitrate, volatile organic chemical (VOC), inorganic chemical (IOC), haloacetic acid, synthetic organic chemical (SOC), coliform, total trihalomethane, lead and copper, lead in schools, and general sampling procedure.
    - *Safe Drinking Water*, publication #331-004
    - *Getting Drinking Water Information* #331-185
    - Publications online: http://www4.doh.wa.gov/dw/publications

  Office of Drinking Water Homepage: http://www.doh.wa.gov/ehp/dw

- U.S. Geological Survey

  http://www.usgs.gov

Appendix I
Regulated Contaminants in Washington State (WAC 246-290-72012)

Contaminant (units)	Traditional MCL in mg/L	To convert for CCR, multiply by	MCL in CCR units	MCLG	Major Sources in Drinking Water	Health Effects Language
Microbiological Contaminants						
Total Coliform Bacteria	MCL: (systems that collect 40 samples/ month) 5% of monthly samples are positive; (systems that collect < 40 samples/ month) 1 positive monthly sample		MCL: (systems that collect 40 samples/ month) 5% of monthly samples are positive; (systems that collect < 40 samples/ month) 1 positive monthly sample	0	Naturally present in the environment	Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other, potentially-harmful, bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.
Contaminant (units)	**Traditional MCL in mg/L**	**To convert for CCR, multiply by**	**MCL in CCR units**	**MCLG**	**Major Sources in Drinking Water**	**Health Effects Language**
Fecal coliform and *E. coli*	0		0	0	Human and animal fecal waste	Fecal coliforms and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely-compromised immune systems.

Total organic carbon (ppm)	TT	-	TT	n/a	Naturally present in the environment	Total organic carbon (TOC) has no health effects. However, total organic carbon provides a medium for the formation of disinfection by-products. These by-products include trihalomethanes (THMs) and haloacetic acids (HAAs). Drinking water containing these by-products in excess of the MCL may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of getting cancer.
Turbidity (NTU)	TT.	-	TT	n/a	Soil runoff	Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea and associated headaches.
Radioactive Contaminants						
Beta/photon emitters (mrem/yr) .*Effective 12/08/03	4 mrem/yr	-	4	n/a 0	Decay of natural and man-made deposits	Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer.

Alpha emitters (pCi/l) .*Effective 12/08/03	15 pCi/l	-	15	n/a 0	Erosion of natural deposits	Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer.
Combined radium (pCi/l) .*Effective 12/08/03	5 pCi/l	-	5	n/a 0	Erosion of natural deposits	Some people who drink water containing radium 226 or 228 in excess of the MCL over many years may have an increased risk of getting cancer.
Uranium (pCi/l) .*Effective 12/08/03	30 micro g/l	-	30	0	Erosion of natural deposits	Some people who drink water containing uranium in excess of the MCL over many years may have an increased risk of getting cancer and kidney toxicity.
Inorganic Contaminants						
Antimony (ppb)	.006	1000	6	6	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	Some people who drink water containing antimony well in excess of the MCL over many years could experience increases in blood cholesterol and decreases in blood sugar.
Arsenic (ppb) .*Effective 1/23/06	.05 0.01	1000 1000	50 10	n/a 0	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes	Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.
Asbestos (MFL)	7 MFL	-	7	7	Decay of asbestos cement water mains; Erosion of natural deposits	Some people who drink water containing asbestos in excess of the MCL over many years may have an increased risk of developing benign intestinal polyps.

Barium (ppm)	2	-	2	2	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits	Some people who drink water containing barium in excess of the MCL over many years could experience an increase in their blood pressure.
Beryllium (ppb)	.004	1000	4	4	Discharge from metal refineries and coal-burning factories; Discharge from electrical, aerospace, and defense industries	Some people who drink water containing beryllium well in excess of the MCL over many years could develop intestinal lesions.
Cadmium (ppb)	.005	1000	5	5	Corrosion of galvanized pipes; Erosion of natural deposits; Discharge from metal refineries; Runoff from waste batteries and paints	Some people who drink water containing cadmium in excess of the MCL over many years could experience kidney damage.
Chromium (ppb)	.1	1000	100	100	Discharge from steel and pulp mills; Erosion of natural deposits	Some people who use water containing chromium well in excess of the MCL over many years could experience allergic dermatitis.
Copper (ppm)	AL.= 1.3	-	AL.= 1.3	1.3	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives	Copper is an essential nutrient, but some people who drink water containing copper in excess of the action level over a relatively short amount of time could experience gastrointestinal distress. Some people who drink water containing copper in excess of the action level over many years could suffer liver or kidney damage. People with Wilson's Disease should consult their personal doctor.

Cyanide (ppb)	.2	1000	200	200	Discharge from steel/metal factories; Discharge from plastic and fertilizer factories	Some people who drink water containing cyanide well in excess of the MCL over many years could experience nerve damage or problems with their thyroid.
Fluoride (ppm)	4	-	4	4	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories	Some people who drink water containing fluoride in excess of the MCL over many years could get bone disease, including pain and tenderness of the bones. Fluoride in drinking water at half the MCL or more may cause mottling of children's teeth, usually in children less than nine years old. Mottling, also known as dental fluorosis, may include brown staining and/or pitting of the teeth, and occurs only in developing teeth before they erupt from the gums.
Lead (ppb)	AL.= .015	1000	AL.= 15	0	Corrosion of household plumbing systems; Erosion of natural deposits	Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.
Mercury [inorganic] (ppb)	.002	1000	2	2	Erosion of natural deposits; Discharge from refineries and factories; Runoff from landfills; Runoff from cropland	Some people who drink water containing inorganic mercury well in excess of the MCL over many years could experience kidney damage.

Nitrate (ppm)	10	-	10	10	Runoff from fertilizer use; Leaching from septic tanks, sew-age; Erosion of natural deposits	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.
Nitrite (ppm)	1	-	1	1	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.
Selenium (ppb)	.05	1000	50	50	Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines	Selenium is an essential nutrient. However, some people who drink water containing selenium in excess of the MCL over many years could experience hair or fingernail losses, numbness in fingers or toes, or problems with their circulation.
Thallium (ppb)	.002	1000	2	0.5	Leaching from ore-processing sites; Discharge from electronics, glass, and drug factories	Some people who drink water containing thallium in excess of the MCL over many years could experience hair loss, changes in their blood, or problems with their kidneys, intestines, or liver.
Synthetic Organic Contaminants including Pesticides and Herbicides						
2,4-D (ppb)	.07	1000	70	70	Runoff from herbicide used on row crops	Some people who drink water containing the weed killer 2,4-D well in excess of the MCL over many years could experience problems with their kidneys, liver, or adrenal glands.
2,4,5-TP [Silvex](ppb)	.05	1000	50	50	Residue of banned herbicide	Some people who drink water containing silvex in excess of the MCL over many years could experience liver problems.

Acrylamide	TT	-	TT	0	Added to water during sewage/ wastewater treatment	Some people who drink water containing high levels of acrylamide over a long period of time could have problems with their nervous system or blood, and may have an increased risk of getting cancer.
Alachlor (ppb)	.002	1000	2	0	Runoff from herbicide used on row crops	Some people who drink water containing alachlor in excess of the MCL over many years could have problems with their eyes, liver, kidneys, or spleen, or experience anemia, and may have an increased risk of getting cancer.
Atrazine (ppb)	.003	1000	3	3	Runoff from herbicide used on row crops	Some people who drink water containing atrazine well in excess of the MCL over many years could experience problems with their cardiovascular system or reproductive difficulties.
Benzo(a)pyrene [PAH] (nanograms/l)	.0002	1,000,000	200	0	Leaching from linings of water storage tanks and distribution lines	Some people who drink water containing benzo(a)pyrene in excess of the MCL over many years may experience reproductive difficulties and may have an increased risk of getting cancer.
Carbofuran (ppb)	.04	1000	40	40	Leaching of soil fumigant used on rice and alfalfa	Some people who drink water containing carbofuran in excess of the MCL over many years could experience problems with their blood, or nervous or reproductive systems.
Chlordane (ppb)	.002	1000	2	0	Residue of banned termiticide	Some people who drink water containing chlordane in excess of the MCL over many years could experience problems with their liver or nervous system, and may have an increased risk of getting cancer.

Dalapon (ppb)	.2	1000	200	200	Runoff from herbicide used on rights of way	Some people who drink water containing dalapon well in excess of the MCL over many years could experience minor kidney changes.
Di(2-ethylhexyl) adipate (ppb)	.4	1000	400	400	Discharge from chemical factories	Some people who drink water containing di (2-ethylhexyl) adipate well in excess of the MCL over many years could experience general toxic effects or reproductive difficulties.
Di(2-ethylhexyl) phthalate (ppb)	.006	1000	6	0	Discharge from rubber and chemical factories	Some people who drink water containing di (2-ethylhexyl) phthalate in excess of the MCL over many years may have problems with their liver, or experience reproductive difficulties, and may have an increased risk of getting cancer.
Dibromochloropropane (ppt)	.0002	1,000,000	200	0	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	Some people who drink water containing DBCP in excess of the MCL over many years could experience reproductive problems and may have an increased risk of getting cancer.
Dinoseb (ppb)	.007	1000	7	7	Runoff from herbicide used on soybeans and vegetables	Some people who drink water containing dinoseb well in excess of the MCL over many years could experience reproductive difficulties.
Diquat (ppb)	.02	1000	20	20	Runoff from herbicide use	Some people who drink water containing diquat in excess of the MCL over many years could get cataracts.
Dioxin [2,3,7,8-TCDD] (ppq)	.00000003	1,000,000,000	30	0	Emissions from waste incineration and other combustion; Discharge from chemical factories	Some people who drink water containing dioxin in excess of the MCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.

Endothall (ppb)	.1	1000	100	100	Runoff from herbicide use	Some people who drink water containing endothall in excess of the MCL over many years could experience problems with their stomach or intestines.
Endrin (ppb)	.002	1000	2	2	Residue of banned insecticide	Some people who drink water containing endrin in excess of the MCL over many years could experience liver problems.
Epichlorohydrin	TT	-	TT	0	Discharge from industrial chemical factories; An impurity of some water treatment chemicals	Some people who drink water containing high levels of epichlorohydrin over a long period of time could experience stomach problems, and may have an increased risk of getting cancer.
Ethylene dibromide (ppt)	.00005	1,000,000	50	0	Discharge from petroleum refineries	Some people who drink water containing ethylene dibromide in excess of the MCL over many years could experience problems with their liver, stomach, reproductive system, or kidneys, and may have an increased risk of getting cancer.
Glyphosate (ppb)	.7	1000	700	700	Runoff from herbicide use	Some people who drink water containing glyphosate in excess of the MCL over many years could experience problems with their kidneys or reproductive difficulties.
Heptachlor (ppt)	.0004	1,000,000	400	0	Residue of banned pesticide	Some people who drink water containing heptachlor in excess of the MCL over many years could experience liver damage and may have an increased risk of getting cancer.
Heptachlor epoxide (ppt)	.0002	1,000,000	200	0	Breakdown of heptachlor	Some people who drink water containing heptachlor epoxide in excess of the MCL over many years could experience liver damage, and may have an increased risk of getting cancer.

Hexachlorobenzene (ppb)	.001	1000	1	0	Discharge from metal refineries and agricultural chemical factories	Some people who drink water containing hexachlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys, or adverse reproductive effects, and may have an increased risk of getting cancer.
Hexachlorocyclo-pentadiene (ppb)	.05	1000	50	50	Discharge from chemical factories	Some people who drink water containing hexachlorocyclopenta-diene well in excess of the MCL over many years could experience problems with their kidneys or stomach.
Lindane (ppt)	.0002	1,000,000	200	200	Runoff/leaching from insecticide used on cattle, lumber, gardens	Some people who drink water containing lindane in excess of the MCL over many years could experience problems with their kidneys or liver.
Methoxychlor (ppb)	.04	1000	40	40	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	Some people who drink water containing methoxychlor in excess of the MCL over many years could experience reproductive difficulties.
Oxamyl [Vydate] (ppb)	.2	1000	200	200	Runoff/leaching from insecticide used on apples, potatoes and tomatoes	Some people who drink water containing oxamyl in excess of the MCL over many years could experience slight nervous system effects.
PCBs [Polychlorinated biphenyls] (ppt)	.0005	1,000,000	500	0	Runoff from landfills; Discharge of waste chemicals	Some people who drink water containing PCBs in excess of the MCL over many years could experience changes in their skin, problems with their thymus gland, immune deficiencies, or reproductive or nervous system difficulties, and may have an increased risk of getting cancer.

Pentachlorophenol (ppb)	.001	1000	1	0	Discharge from wood preserving factories	Some people who drink water containing pentachlorophenol in excess of the MCL over many years could experience problems with their liver or kidneys, and may have an increased risk of getting cancer.
Picloram (ppb)	.5	1000	500	500	Herbicide runoff	Some people who drink water containing picloram in excess of the MCL over many years could experience problems with their liver.
Simazine (ppb)	.004	1000	4	4	Herbicide runoff	Some people who drink water containing simazine in excess of the MCL over many years could experience problems with their blood.
Toxaphene (ppb)	.003	1000	3	0	Runoff/leaching from insecticide used on cotton and cattle	Some people who drink water containing toxaphene in excess of the MCL over many years could have problems with their kidneys, liver, or thyroid, and may have an increased risk of getting cancer.
Volatile Organic Contaminants						
Benzene (ppb)	.005	1000	5	0	Discharge from factories; Leaching from gas storage tanks and landfills	Some people who drink water containing benzene in excess of the MCL over many years could experience anemia or a decrease in blood platelets, and may have an increased risk of getting cancer.
Bromate (ppb)	.010	1000	10	0	By-product of drinking water chlorination	Some people who drink water containing bromate in excess of the MCL over many years may have an increased risk of getting cancer.

Carbon tetrachloride (ppb)	.005	1000	5	0	Discharge from chemical plants and other industrial activities	Some people who drink water containing carbon tetrachloride in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.
Chloramines (ppm)	MRDL. = 4	-	MRDL. =4	MRDL G. = 4	Water additive used to control microbes	Some people who use drinking water containing chloramines well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water containing chloramines well in excess of the MRDL could experience stomach discomfort or anemia.
Chlorine (ppm)	MRDL. = 4	-	MRDL. =4	MRDL G. = 4	Water additive used to control microbes	Some people who use drinking water containing chlorine well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water containing chlorine well in excess of the MRDL could experience stomach discomfort.
Chlorite (ppm)	1	-	1	0.8	By-product of drinking water chlorination	Some infants and young children who drink water containing chlorite in excess of the MCL could experience nervous system effects. Similar effects may occur in fetuses of pregnant mothers who drink water containing chlorite in excess of the MCL. Some people may experience anemia.

Chlorine dioxide (ppb)	MRDL. = .8	1000	MRDL = 800	MRDL G. =800	Water additive used to control microbes	Some infants and young children who drink water containing chlorine dioxide in excess of the MRDL could experience nervous system effects. Similar effects may occur in fetuses of pregnant mothers who drink water containing chlorine dioxide in excess of the MRDL. Some people may experience anemia.
Chlorobenzene (ppb)	.1	1000	100	100	Discharge from chemical and agricultural chemical factories	Some people who drink water containing chlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys.
o-Dichlorobenzene (ppb)	.6	1000	600	600	Discharge from industrial chemical factories	Some people who drink water containing o-dichlorobenzene well in excess of the MCL over many years could experience problems with their liver, kidneys, or circulatory systems.
p-Dichlorobenzene (ppb)	.075	1000	75	75	Discharge from industrial chemical factories	Some people who drink water containing p-dichlorobenzene in excess of the MCL over many years could experience anemia, damage to their liver, kidneys, or spleen, or changes in their blood.
1,2-Dichloroethane (ppb)	.005	1000	5	0	Discharge from industrial chemical factories	Some people who drink water containing 1,2-dichloroethane in excess of the MCL over many years may have an increased risk of getting cancer.
1,1-Dichloroethylene (ppb)	.007	1000	7	7	Discharge from industrial chemical factories	Some people who drink water containing 1,1-dichloroethylene in excess of the MCL over many years could experience problems with their liver.
cis-1,2-Dichloroethylene (ppb)	.07	1000	70	70	Discharge from industrial chemical factories	Some people who drink water containing cis-1, 2-dichloroethylene in excess of the MCL over many years could experience problems with their liver.

trans-1,2-Dichloroethylene (ppb)	.1	1000	100	100	Discharge from industrial chemical factories	Some people who drink water containing trans-1, 2-dichloroethylene well in excess of the MCL over many years could experience problems with their liver.
Dichloromethane (ppb)	.005	1000	5	0	Discharge from pharmaceutical and chemical factories	Some people who drink water containing dichloromethane in excess of the MCL over many years could have liver problems and may have an increased risk of getting cancer.
1,2-Dichloropropane (ppb)	.005	1000	5	0	Discharge from industrial chemical factories	Some people who drink water containing 1,2-dichloropropane in excess of the MCL over many years may have an increased risk of getting cancer.
Ethylbenzene (ppb)	.7	1000	700	700	Discharge from petroleum refineries	Some people who drink water containing ethylbenzene well in excess of the MCL over many years could experience problems with their liver or kidneys.
Haloacetic Acids (HAA) (ppb)	.060	1000	60	n/a	By-product of drinking water disinfection	Some people who drink water containing haloacetic acids in excess of the MCL over many years may have an increased risk of getting cancer.
Styrene (ppb)	.1	1000	100	100	Discharge from rubber and plastic factories; Leaching from landfills	Some people who drink water containing styrene well in excess of the MCL over many years could have problems with their liver, kidneys, or circulatory system.
Tetrachloroethylene (ppb)	.005	1000	5	0	Discharge from factories and dry cleaners	Some people who drink water containing tetrachloroethylene in excess of the MCL over many years could have problems with their liver, and may have an increased risk of getting cancer.

1,2,4-Trichlorobenzene (ppb)	.07	1000	70	70	Discharge from textile-finishing factories	Some people who drink water containing 1,2,4-trichlorobenzene well in excess of the MCL over many years could experience changes in their adrenal glands.
1,1,1-Trichloroethane (ppb)	.2	1000	200	200	Discharge from metal degreasing sites and other factories	Some people who drink water containing 1,1,1-trichloroethane in excess of the MCL over many years could experience problems with their liver, nervous system, or circulatory system.
1,1,2-Trichloroethane (ppb)	.005	1000	5	3	Discharge from industrial chemical factories	Some people who drink water containing 1,1,2-trichloroethane well in excess of the MCL over many years could have problems with their liver, kidneys, or immune systems.
Trichloroethylene (ppb)	.005	1000	5	0	Discharge from metal degreasing sites and other factories	Some people who drink water containing trichloroethylene in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.
TTHMs [Total trihalomethanes] (ppb)	0.10/.080	1000	100/80	n/a	By-product of drinking water chlorination	Some people who drink water containing trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer.
Toluene (ppm)	1	-	1	1	Discharge from petroleum factories	Some people who drink water containing toluene well in excess of the MCL over many years could have problems with their nervous system, kidneys, or liver.
Vinyl Chloride (ppb)	.002	1000	2	0	Leaching from PVC piping: Discharge from plastics factories	Some people who drink water containing vinyl chloride in excess of the MCL over many years may have an increased risk of getting cancer.

Xylenes (ppm)	10	-	10	10	Discharge from petroleum factories; Discharge from chemical factories	Some people who drink water containing xylenes in excess of the MCL over many years could experience damage to their nervous system.

KEY

AL = Action Level
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MFL = million fibers per liter
MRDL = Maximum Residual Disinfectant Level
MRDLG = Maximum Residual Disinfectant Level Goal
mrem/year = millirems per year (a measure of radiation absorbed by the body)
N/A = Not Applicable
NTU = Nephelometric Turbidity Units (a measure of water clarity)
pCi/1 = picocuries per liter (a measure of radioactivity)
ppm = parts per million, or milligrams per liter (mg/1)
ppb = parts per billion, or micrograms per liter (g/1)
ppt = parts per trillion, or nanograms per liter
ppq = parts per quadrillion, or picograms per liter
TT = Treatment Technique

Appendix II
Glossary Of Common Terms And Abbreviations

Acidic

The condition of water or soil containing a sufficient amount of acidic substances to lower the pH below 7.0.

Action Level

The level of lead or copper, which, if exceeded, triggers treatment or other requirements that a public water system, must follow.

Acute Health Effect

An immediate effect that may result from exposure to certain drinking water contaminants.

Alkaline

The condition of water or soil containing a sufficient amount of alkaline substances to raise the pH above 7.0.

Background Level

The average presence of a substance in the environment or occurring naturally.

Bacteria

Microscopic living organisms usually consisting of a single cell. Some bacteria in soil, water, or air may cause human, animal, and plant health problems.

Carcinogen

Any substance that produces cancer in an organism.

Central Nervous System (CNS)

Portion of the nervous system consisting of the brain and spinal cord.

Chronic Health Effect

The possible result of exposure over many years to a drinking water contaminant at levels above its maximum contaminant level (MCL).

Coliform

A group of bacteria found in the intestines of warm-blooded animals (including humans) and in plants, soil, air, and water. Fecal coliforms are a specific class of bacteria that inhabit only the intestines of warm-blooded animals. The presence of coliform is an indication that the water is polluted and may contain disease-causing organisms.

Conductivity

A measure of the ability of water to carry an electric current. Related to the total dissolved solids (TDS) in the water.

Contaminant

Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on air, water, or soil.

Corrosivity

An indication of the corrosiveness of a water sample, as described by the water pH, alkalinity, hardness, temperature, total dissolved solids, and dissolved oxygen concentration. The Langelier Saturation Index combines several of these features and is the commonly accepted measure of corrosivity.

Cryptosporidium Parvum

Flagellate protozoan that is shed during its oocyst stage with the feces of man and animals. When water containing these oocysts is ingested, the protozoan causes a severe gastrointestinal disease.

Exposure

Contact with a chemical or physical agent.

Fecal Coliform Bacteria

Bacteria found in the intestinal tracts of animals. Their presence in water is an indicator of pollution and possible contamination by pathogens.

Filtration

A process for removing particulate matter from water by passage through porous media.

First Draw

The water that immediately comes out when a faucet is first opened. This water is likely to have the highest levels of lead and copper contamination from plumbing materials.

Gallons Per Minute (gpm)

A common unit used to express the flow of water over time.

Gastroenteritis

An inflammation of the stomach and intestine resulting in diarrhea, with vomiting and cramps when irritation is excessive. When caused by an infectious agent, it is often associated with fever.

Giardia Lamblia

Flagellate protozoan that is shed during its oocyst stage with the feces of man and animals. When water containing these oocysts is ingested, the protozoan causes a severe gastrointestinal disease called giardiasis.

Gram (g)

A unit of mass (weight) equivalent to one milliliter of water at 4 degrees Celsius. 1/454 of a pound.

Granular Activated Carbon (GAC)

Material used in water treatment devices to remove organic chemicals, radon, and other contaminants.

Gross Alpha Particle Activity

The total radioactivity due to alpha particle emission, as inferred from measurements on a dry sample. Alpha particles do not penetrate solid materials.

Gross Beta Particle Activity

The total radioactivity due to beta particle emission, as inferred from measurements on a dry sample. Beta particles penetrate solid materials and are more hazardous.

Groundwater

The supply of fresh water found beneath the Earth's surface, usually in aquifers, that are often used for supplying wells and springs. Because groundwater is a major source of drinking water, there is growing concern over areas where leaching agricultural or industrial contaminants or substances from leaking underground storage tanks are contaminating groundwater.

Heavy Metals

Metallic elements with high atomic weights; for example, mercury, chromium, cadmium, arsenic, and lead. They can damage living things at low concentrations and tend to accumulate in the food chain.

Heterotrophic Plate Count (HPC)

A measure of the total number of bacteria in a sample. Also known as the Standard Plate Count (SPC).

Inorganic Chemicals (IOCs)

Chemicals of mineral origin.

Maximum Contaminant Level (MCL)

The maximum level of a health-related contaminant permitted in a public water system. Also known as a primary drinking water standard.

Maximum Contaminant Level Goal (MCLG)

The maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. Maximum contaminant level goals are non-enforceable health goals.

Microgram (µg)

One-millionth of a gram.

Micrograms Per Liter (µg/L)

One microgram of a substance dissolved in each liter of water. This unit is equal to parts per billion (ppb).

Microorganisms

Living organisms that can be seen individually only with the aid of a microscope.

Milligram (mg)

One-thousandth of a gram.

Milligrams Per Liter (mg/L)

A measure of concentration of a dissolved substance. A concentration of one mg/L means that one milligram of a substance is dissolved in each liter of water. For practical purposes, this unit is equal to parts per million (ppm).

Most Probable Number (MPN)

MPN is the Most Probable Number of coliform group organisms per unit volume of sample water as determined by a statistical relationship. Expressed as the number of organisms per 100 ml of sample water.

ND

Abbreviation for “Not Detected.” Laboratory expression for a concentration of a substance in water too small to be detected by the instrumentation used.

Nonpotable

Water that may contain objectionable pollution, contamination, minerals, or infective agents and is considered unsafe or unpalatable for drinking.

National Sanitation Foundation (NSF)

Independent testing organization for water treatment equipment.

Nephelometric Turbidity Unit (NTU)

Unit of measure for turbidity in water.

Nonvolatile Organic Chemicals

Organic chemicals that do not escape readily from water into air. Also known as Synthetic Organic Chemicals (SOCs).

Organics

A term used to refer to chemical compounds made from carbon molecules.

Parts Per Million (ppm)

Parts per million parts, a measurement of concentration on a weight or volume basis. This term is equivalent to milligrams per liter (mg/L).

Parts Per Billion (ppb)

Parts per billion parts, a measurement of concentration on a weight or volume basis. This term is equivalent to micrograms per liter (µg/L).

Pathogens

Microorganisms that can cause disease in other organisms or in humans, animals, and plants. They may be bacteria, viruses, or parasites, and are found in sewage and runoff from animal farms or rural areas populated with domestic and/or wild animals, and in water used for swimming.

Pesticide

Any substance or chemical designed or formulated to kill or control weeds or animal pests.

pH

An expression of the intensity of the basic or acid condition of a liquid. Mathematically related to the hydrogen ion concentration, the pH may range from 0 to 14, where 0 is most acid, 14 most basic, and 7 neutral. Natural waters usually have a pH between 6.5 and 8.5.

Picocurie per liter (pCi/L)

A measure of radioactivity in water commonly used for radon. One picocurie of radioactivity is equivalent to 0.037 nuclear disintegrations per second as measured by a Geiger counter.

Potable Water

Water that is safe and satisfactory for drinking and cooking.

Primary Drinking Water Standard

See Maximum Contaminant Level (MCL).

Public Water System

A system for conveying piped water for human consumption to the public, having at least 15 service connections or regularly providing water at least 60 days out of the year to 25 or more people per day. A public water system is either a "community water system" (town) or a "noncommunity water system" (gas station, camp, etc).

Septic System

An onsite system designed to treat and dispose of domestic sewage.

Secondary Maximum Contaminant Level (SMCL)

Limits or standards given to contaminants that have only aesthetic effects in water.

Secondary Drinking Water Standard

See Secondary Maximum Contaminant Level (SMCL).

Standard Plate Count (SPC)

See Heterotrophic Plate Count (HPC).

Surface Water

All water naturally open to the atmosphere, and all springs, wells, or other collectors that are directly influenced by surface water.

Synthetic Organic Chemicals (SOC)

Term used to describe nonvolatile organic chemicals such as most pesticides.

Total Dissolved Solids (TDS)

A measure of all of the dissolved ions in water.

TNTC

Abbreviation for "Too Numerous to Count." A measure of bacteria concentration.

Turbidity

The cloudy appearance of water caused by the presence of suspended and colloidal matter. Used to indicate the clarity of water.

Virus

The smallest form of microorganism capable of causing disease.

Volatile Organic Chemicals (VOCs)

Organic chemicals that escape readily into the air from water.